Introduction

Breast milk alone is the ideal start to a child's life. This book deals with the period when a child continues to receive breast milk but also needs increasing amounts of additional foods, before eventually changing to family foods alone. The book shows that breast milk can continue to be an important source of nutrients until the child is at least two years old. It also shows how mixtures of family foods can meet the extra needs of young children during this vulnerable time. These foods, given *in addition* to breast milk, are called *complementary foods*. The process of feeding them is called *complementary feeding*.

Breast milk can continue to be an important source of nutrients until the child is at least 2 years old.

To keep young children healthy during this period, complementary foods should be nutritious, clean and safe, and fed in adequate amounts. They may be specially prepared foods, or modified family meals. This book tells you when to start complementary feeding, what to give, how much, and how often. It also explains how to encourage young children to eat enough, how to keep their food clean and safe, and how to feed sick children. The book takes into account the results of recent studies on young child feeding, growth, and childhood illness including diarrhoea.

The information in this book will help you to understand more about the nutritional value of foods available in your area and will be useful when you advise and counsel families on child feeding. Space is provided for notes on your local situation so that you can adapt the feeding recommendations for the communities where you work. There is a section at the end (pages 46–47) to explain the meaning of words that may be unfamiliar. The book is for everyone responsible for the health and nutrition of young children, particularly health and nutrition workers, and their trainers. It will be of practical value for the in-service training of health workers, such as those taking the WHO/UNICEF courses on the Integrated Management of Childhood Illness,[1] and other counselling[2] or training courses[3] on breastfeeding.

'Complementary feeding' means giving other foods in addition to breast milk.

[1] *Integrated Management of Childhood Illnesses WHO/CHD/97.3.*

[2] *Breastfeeding Counselling: A Training Course WHO/CHD/93.3,4,5 & 6. UNICEF/NUT/93.1,2,3 & 4.*

[3] *HIV and Infant Feeding: A Training Course WHO/FCH/CAH/00.2,3,4 & 5.*

Key recommendations

Breast milk is the natural first food for babies and should be fed alone for at least 4 months and if possible 6 months. However, after this period additional foods (complementary foods) are needed. To make sure that young children grow well and stay healthy, it is important to know which foods to give, how much to give, and how often. Breast milk should be the main food throughout the baby's first year, and an important food during the second year. Breast milk continues to provide unique anti-infective factors that other foods cannot.

The list below is to remind you of the main messages to consider when discussing complementary feeding with parents and others caring for young children, or when training health workers. Why these recommendations are important is explained in the rest of the book.

- Give breast milk *alone* for at least 4 months, and until 6 months if possible. Breast milk contains all the energy and nutrients a baby needs for healthy growth as well as anti-infective factors, which protect against diarrhoea and other infections.
- Give a child complementary foods between 4 and 6 months only if he or she:
  - ⇒ is not gaining weight adequately, despite appropriate breastfeeding
  - ⇒ receives frequent breastfeeds but appears hungry soon after.
- Breastfeed for two years or longer.
- When starting complementary foods, continue breastfeeding as often as before — meaning as often as the child wants. Keep the length of each breastfeed the same as before.
- Give complementary foods that are:
  - ⇒ rich in energy and nutrients
  - ⇒ clean and safe
  - ⇒ easy to prepare from family foods
  - ⇒ locally available and affordable.
- Give complementary foods three times daily to breastfed babies aged 6–7 months, increasing to five times daily by 12 months. Start with a few teaspoons and gradually increase the amount and variety.
- Actively encourage a child to eat at mealtimes and when having snacks.
- Make sure all utensils are clean.
- Spoon-feed complementary foods from a cup or bowl. Do *not* give from a feeding bottle.
- If complementary foods are not kept in a refrigerator, feed them within 2 hours of preparation.
- During and after illness, breastfeed more frequently than usual, and give extra meals.
- After illness, encourage a child to eat as much as possible at each meal. Continue this until the child regains any lost weight and is growing well again.
- Keep a chart of a young child's weight. Monitoring growth is a useful way to know if a child is eating enough and is healthy.

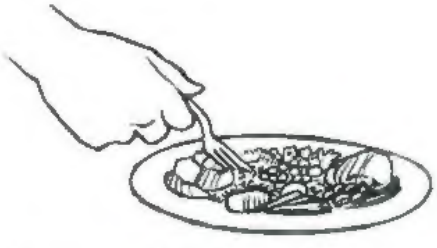
What is complementary feeding?

Complementary feeding means giving other foods *in addition* to breast milk.[1] These other foods are called *complementary foods*. During the period of complementary feeding, a baby *gradually* becomes accustomed to eating family foods. At the end of this period (usually at around the age of 2 years), breast milk is entirely replaced by family foods, although a child may still sometimes suckle for comfort.

There are two kinds of complementary foods:

- *specially prepared foods* and
- *usual family foods that are modified* to make them easy to eat and provide enough nutrients.

For example, a mother may *specially prepare* porridge for her baby while the rest of the family eat cassava and groundnut stew. When the child is a little older, the mother will give the cassava mashed in the stew. Mashing *modifies the consistency* of the family food, making it easier for the child to eat. Family meals can also be modified by adding something *extra*, for example adding a piece of mango to give extra vitamin A, or liver for extra iron, and oil or margarine for extra energy.



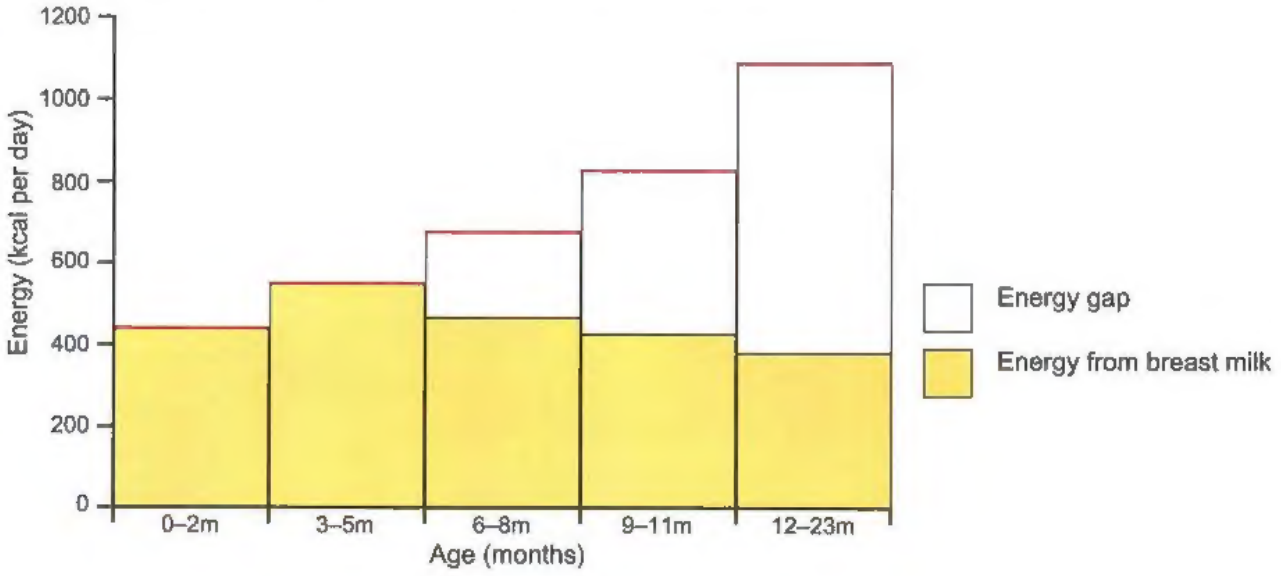
Mashing a child's food makes it easier to eat.

Why are complementary foods needed?

As a baby grows and becomes more active, an age is reached when breast milk alone is not sufficient to meet the child's nutritional needs. So complementary foods are then needed to *fill the gap* between the total nutritional needs of the child and the amounts provided by breast milk.

[1] *In this book we focus on the complementary feeding of children aged 6–24 months who are breastfed. Some children, for various reasons, receive little or no breast milk at this age. This means that their total energy and nutrient needs have to be provided by complementary foods and some other source of milk, or from family foods alone. The feeding recommendations in this book may need to be adapted for these children. For example, some children may need larger amounts of family foods or may need to be fed more frequently. Even so, much of the information in the book is relevant to those feeding and caring for children who receive little or no breast milk.*

Figure 1 Energy required (top line) and the amount from breast milk.



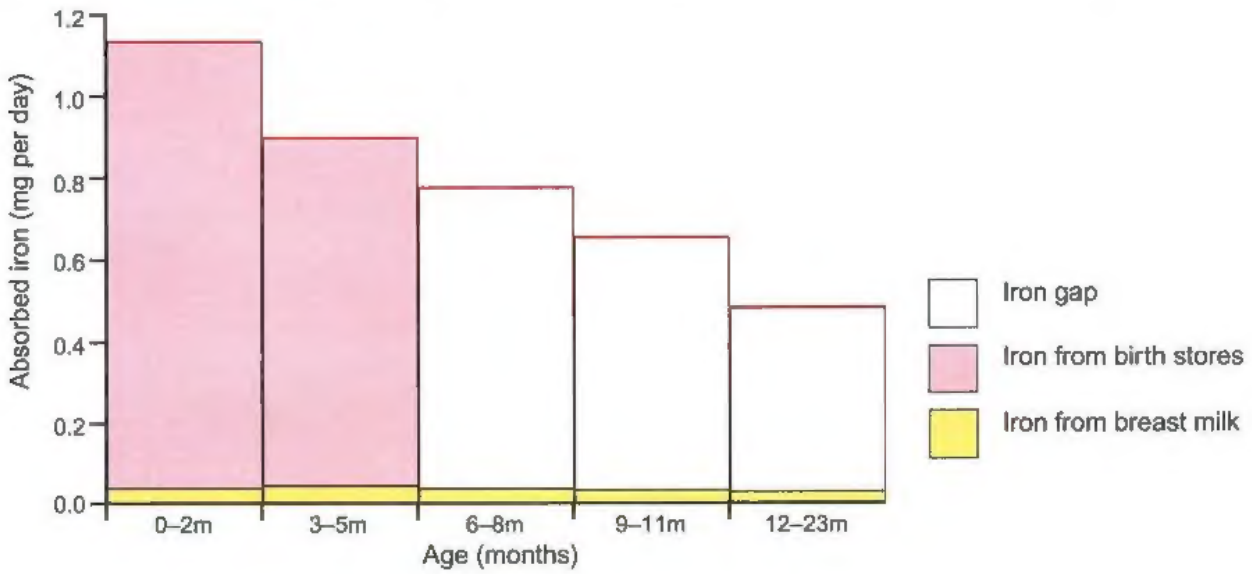
The energy needed by a child increases as the child becomes older, bigger and more active

Figure 1 shows how the *energy* needed by a child (the red line) increases as the child becomes older, bigger and more active. It also shows how much of this energy is supplied by breast milk if a mother breastfeeds frequently (the area shaded yellow). Note that from 6 months onwards there is a *gap* between the total energy needs and the energy provided by breast milk. This gap gets bigger as the child gets older.

This means:

- complementary foods are needed to fill the energy gap
- the quantity of food needed increases as the child becomes older
- if the gap is not filled, the child will stop growing, or grow slowly.

Figure 2 Absorbed iron needed (top line) and the amount from breast milk and body stores at birth.



Now look what happens if we consider iron instead of energy. The red line in ***Figure 2*** shows the daily amount of iron a child needs at different ages. You can see that this gradually becomes less. This is because the amount needed is related to how much new blood a child's body has to make. More new blood is made in the first year (when growth is faster) than in the second.

The gap between the iron needed and the amount provided by breast milk is the amount of iron a child needs to absorb from complementary foods. Notice that the amount of iron that a child receives from breast milk is small. So there is a large gap between what the child needs and what is provided by breast milk, especially in the first year.

Full-term babies are born with enough iron to cover their needs in the early months and they use their iron store (shaded pink in Figure 2) to fill the gap. But this store is used up by about 6 months.

This means:

- complementary foods that provide plenty of iron are needed to fill the iron gap from about 6 months of age
- if the iron gap is not filled, the child will become anaemic
- the iron gap is biggest from 6–12 months, so the risk of anaemia is highest in this age group
- preterm and low-birth-weight babies are at increased risk of anaemia because they are born with smaller body stores of

iron, so the iron gap starts earlier. Give iron drops from 2 months, if available.

We could draw similar diagrams for all the nutrients. These would show that:

- for most nutrients, the gap becomes larger as the child gets older
- for calcium, like iron, the gap is smaller in the second year, but it is still large.

In the diagrams, we show the needs of an 'average' child, and the nutrients supplied by breast milk from an 'average' mother. Other children of the same age may need slightly different amounts of energy and nutrients. A few children have higher needs and therefore larger gaps than shown; a few have smaller needs and smaller gaps. But for all children, the most difficult gaps to fill are usually for:

- energy
- iron
- zinc
- vitamin A.

Knowing why mothers start complementary foods too early or too late helps you to decide how to counsel them. For example, mothers often start early because they think they do not have enough breast milk. This may be because the baby cries a lot. Once you understand their reasons, you can give appropriate advice. For example, let the baby suckle more often or for longer periods.

TIP

Listening to mothers and letting them know that you are interested in how they feed their babies and asking questions in a friendly way is an important part of understanding their opinion and the things that worry them, and the difficulties they face.

TIP

When should complementary foods be started?

Complementary foods should be started when the baby can no longer get enough energy and nutrients from breast milk alone. For most babies this is between 4 and 6 months of age. This is also the age when nerves and muscles in the mouth develop sufficiently to let the baby munch, bite and chew. Before 4 months, babies push food out of their mouths because they cannot fully control the movement of their tongues. At 4–6 months of age it becomes easier to feed thick porridges, purees and mashed foods because children:

- can control their tongues better
- start to make up-and-down 'munching' movements
- start to get teeth
- like to put things in their mouths
- are interested in new tastes.

This is also the age when their digestive system is mature enough to digest a range of foods.

Starting complementary feeding too early or starting it too late are both undesirable. Signs that a child is ready to start

complementary foods are that the child:
- is at least 4 months old *and*
- receives frequent breastfeeds but appears hungry soon after *or*
- is not gaining weight adequately.

A child should be fed only breast milk for at least 4 months, and until 6 months if possible. Breast milk provides all the energy and nutrients needed for healthy growth. It contains anti-infective substances which protect the child from diarrhoea and other illnesses.

Giving complementary foods *too soon* is dangerous because:
- a child *does not need* these foods yet, and they may displace breast milk. If foods are given, the child takes less breast milk, and the mother produces less, so later, it may be more difficult to meet the child's nutritional needs
- a child receives less of the protective factors in breast milk, so the risk of illness increases
- the risk of diarrhoea also increases because complementary foods may not be as clean as breast milk
- the foods given instead of breast milk are often thin, watery porridges or soups because these are easy for babies to eat. These foods fill the stomach but provide fewer nutrients than breast milk, and so the child's needs are not met
- mothers are at greater risk of becoming pregnant if they breastfeed less frequently.

Starting complementary feeding *too late* is also dangerous because:
- a child does not get the extra food needed to fill the energy and nutrient gaps
- a child stops growing, or grows slowly
- the risk of malnutrition and micronutrient deficiencies increases.

Discussing issues and ideas with other health workers is helpful. It is a chance to share experiences, and make decisions together. This reduces the risk of health workers giving conflicting advice to mothers. Working together can also lead to more effective action. For example, working together may mean that a radio slot could be organised which might be too ambitious for one person working alone.

Here are some questions to help you record the situation in your area.

1. *At what age do most children start complementary foods in your area?*
   .....months
2. *Is this: too soon (before 4 months)?* ❒ *YES* ❒ *NO*
   between 4 & 6 months? ❒ *YES* ❒ *NO*
   or: too late (after 6 months)? ❒ *YES* ❒ *NO*

   If so, do you know why mothers start complementary foods too soon or too late?

   .....

   .....

   .....
3. *Do you need to discuss with families the best age to start complementary foods?* ❒ *YES* ❒ *NO*

   If so, when is the best time to do this? (e.g. at antenatal visits, at delivery, at clinic visits etc.)

   .....

   .....

   .....
4. *Do you need to discuss these questions with other health workers to hear their opinions? (They may have good ideas too)* ❒ *YES* ❒ *NO*

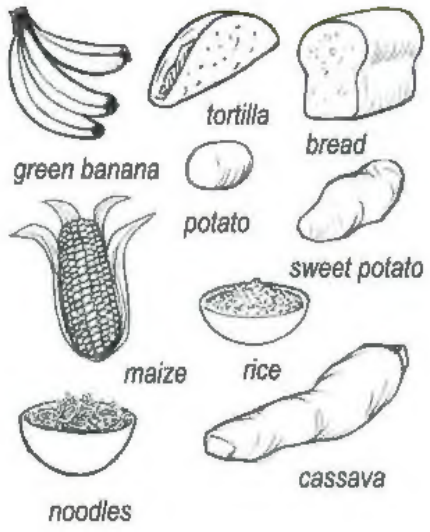
What are good complementary foods?

Good complementary foods are:

- rich in energy, protein and micronutrients (particularly iron, zinc, calcium, vitamin A, vitamin C and folate)
- clean and safe:
  - ⇒ no pathogens (i.e. no disease-causing bacteria or other harmful organisms)
  - ⇒ no harmful chemicals or toxins
  - ⇒ no bones or hard bits that may choke a child
  - ⇒ not boiling hot
- not too peppery or salty
- easy for the child to eat
- liked by the child
- locally available and affordable
- easy to prepare.

The following sections list the different kinds of family foods and show how giving a *mixture of these foods* provides young children with the energy and nutrients they need.

When discussing which mixtures of foods make good meals, it is helpful to start with the local staple and then decide which other foods to add.



Staple foods.

The staple

Every community has a staple food. It is the main food eaten. Examples are *cereals* (such as rice, wheat, maize, millet), *roots* (such as cassava, yam, potato) and *starchy fruits* (such as plantain and breadfruit). In rural areas, families often spend much of their time growing, harvesting, storing and processing the staple food. In urban areas the staple is often bought, and the choice depends partly on cost. Cooked staples can usually be mashed (for example rice, noodles, cassava, potato), or softened in a small amount of liquid (for example bread and chapati). Staples are often milled to a flour and cooked to make a porridge (for example maize, millet).

Staples provide *energy* (mostly from starch). Cereals also provide *protein*, but cassava, sweet potato, banana, plantain and breadfruit contain very little protein. Yam and potato have more protein than other roots, but not as much as cereals.

Staple foods are poor sources of iron, zinc and calcium. Cereals contain *phytates* which may interfere with the absorption of iron, zinc and calcium contained in the cereal *and* in *other* foods in the meal. Fresh roots (such as cassava, potato) provide vitamin C, but flours made from staples have none. Only the yellow varieties of maize, sweet potato and plantain are sources of vitamin A.

This means:

- the staple must be eaten with other foods for a child to get enough nutrients.

Listening to mothers' suggestions is a good way to know what is practical and culturally acceptable.

TIP

Involve the whole family in these discussions if you can. Grandmothers may know about good ideas that were used in the past. Listening to the opinion of husbands is good too. If they know you value their opinion and are prepared to listen to their point of view, they are more likely to accept your suggestions about complementary feeding.

TIP

How can you help families make the local staple suitable for young children? Here are some questions to help you.

Look at the list below and circle the staple used by most families in your area. If there are other staples that are commonly used, circle them as well. If your staple food is not listed, add it under the correct heading.

Cereals	Roots	Starchy fruits
rice	cassava (manioc/yucca)	cooking banana
maize (corn)	yam	breadfruit
wheat	taro (eddo/dasheen)	plantain
millet	tannia (cocoyam)	
sorghum	sweet potato	
quinoa	potato	

1. *What is the staple food in your community?*

   .....

2. *Which type is it?* ❒ *cereal* ❒ *root* ❒ *starchy fruit*
3. *How is your staple food usually eaten (for example is it boiled, or cooked in soup, or made into tortilla, chapati, bread or porridge)?*

   .....

4. *Can young children eat the staple in the way it is usually eaten by the family?*

   ❒ *YES* ❒ *NO*

   If no, can mothers suggest ways to make the staple in the family meal easy for young children to eat, such as mashing and softening it with a little milk and margarine or oil?

   .....

   .....

   .....

   .....

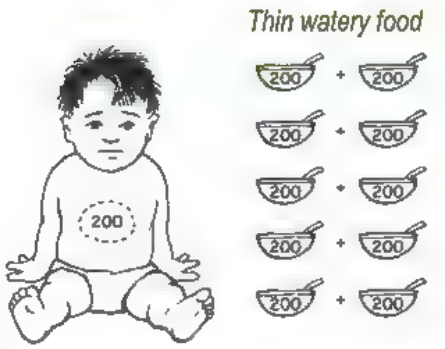
Problems with porridges made from staples alone

Porridge can be made from any staple. When flour or a grated root or starchy fruit is mixed with water and cooked to make porridge, the starch absorbs water and swells up. This makes the porridge thicken. If it is too thick, it is difficult for a young child to eat. So large amounts of water are often added to keep the porridge thin. But this dilutes all the nutrients in the staple.

This means that thin porridges:

- are watery
- have a low energy concentration
- have a low nutrient concentration.

There is a similar problem with soups. Although they may contain nutritious foods, they are very watery and dilute. Even when a child eats as much thin porridge or soup as his/her stomach can hold, and eats five times each day, it is still not enough to meet the nutritional needs of the child.



A baby's stomach can hold 200ml of food

A child cannot manage this

With thin porridge or soup, a child needs to eat 2 bowls at each meal. This is impossible, so his needs are not met.

Do families in your area feed thin porridge? If so, you can suggest one or more of the following ways to make a more energy- and nutrient-rich porridge:

- cook with less water and make a thicker porridge. Porridge should be too thick to drink. So feed thick porridge with a spoon
- replace some (or all) of the water with milk
- add extra energy and nutrients to enrich thick porridge. For example add milk powder and sugar (or margarine or ghee); or add groundnut paste (peanut butter) or sesame seed paste
- adding fatty/oily foods makes thick porridge softer and easier to eat
- toast cereal grains before grinding them into flour. Toasted flour does not thicken much, so less water is needed to make porridge.

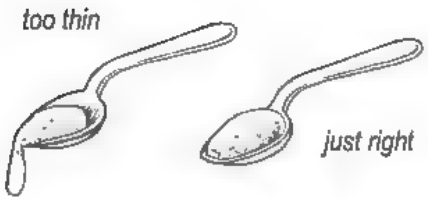
Add extra energy and nutrients to enrich thick porridge.

Do families in your area give soups? If so, you can advise them to:

- take out a mixture of the solid pieces (e.g. staple, beans, meat, vegetables) and mash to a thick puree. Soften with a little margarine or oil for extra energy
- feed this mixture to the child instead of the liquid (the best part of the soup is the solid ingredients in it).

In your area, if cereal grains are germinated (sprouted) before

Give a soft, thick porridge made from the staple, or a cooked staple mashed until it is smooth. The food should be thick enough to stay easily on the spoon.Porridge that is so thin it can be fed from a feeding bottle, or poured from the hand and or drunk from a cup, does not provide enough energy or nutrients (unless it has been specially thinned using germinated flour).



Porridge should be thick enough to stay easily on the spoon.

being eaten, encourage families to dry and grind them into a flour. This type of flour does not thicken much during cooking, so less water can be used. Germination also reduces the phytates present in a cereal so more iron can be absorbed. Another way of using germinated flour is to add a large pinch to ready-cooked thick porridge. This will make it soft and easier for the child to eat. The porridge must cool a little before adding the flour. The porridge should be boiled again for a few minutes after adding the germinated flour. Using this method, there is no reduction in phytates as only a pinch is added.

Importance of feeding a mixture of complementary foods

Other foods must be eaten with the staple to fill the energy and nutrient gaps. The types of foods that fill the gaps best are:

- pulses (such as peas, beans, and groundnuts) and oil seeds (such as sesame seeds)
- foods from animals
- dark-green leaves and orange-coloured fruits and vegetables
- oils, fats and sugars.

Pulses and oil seeds

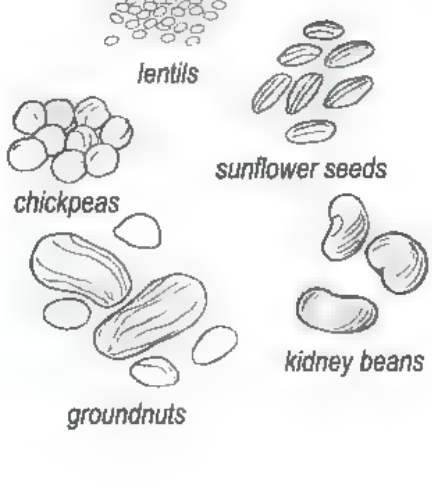
Pulses and oil seeds are good sources of *protein*, but they lack vitamin A and, when dried, they lack vitamin C. Oil seeds and some pulses (groundnuts, bambarra, soybean) are rich in fat and so are high in *energy*. As with cereals, pulses and oil seeds contain phytates which interfere with the absorption of iron, zinc and calcium.

In addition to phytates, most raw peas and beans contain several other *anti-nutrients* that interfere with the way nutrients are used by the body. Thorough cooking destroys most of these substances, but does not destroy phytates. Soaking dry peas and beans and throwing away the water before cooking helps to remove anti-nutrients, and also reduces phytates.

Can you think of ways to help families prepare these foods for young children?

Look at the list below and circle the foods that are available in your area. If there are others, add their names.

Low fat pulses	High fat pulses and oil seeds
chick pea (dhal, bengal gram)	groundnut (peanut)
pigeon pea (dhal, red gram)	bambarra
lentils (split pea, adas)	soybean
lablab (bonavist bean)	pumpkin seed
cowpea	sunflower seeds
blackeye pea	melon seed
red bean (kidney bean)	sesame (sim-sim)
broad bean	shea butter-nut
mung bean (green gram)	cashew nut
navy bean	pine kernels
lima bean	
tarwi	



Now look at the foods you have circled.

1. *Which pulses and oil seeds are commonly eaten in your area?*

   .....

2. *Are they fed to young children?* ❒ *YES* ❒ *NO*

   If no, what are the reasons?

   .....

   .....

3. *How are the circled foods prepared for the family?*

   .....

4. *Are these foods easy for young children to eat and digest?* ❒ *YES* ❒ *NO*

   If no, discuss with families how they could be prepared in a more suitable way. For example:

   - *boil peas or beans, then sieve to remove coarse skins*
   - *remove skins by soaking raw seeds and then rubbing the skins off before cooking*
   - *toast or roast nuts and seeds and pound to a paste.*

   Which ways would most families prefer?

   .....

   .....

5. *Have you circled any foods that are high in fat?* ❒ *YES* ❒ *NO*

   These make good complementary foods because they are rich in both protein and energy.

Foods from animals

Foods from animals, birds and fish (including shellfish) are rich sources of many nutrients but are often expensive. Their flesh (meat) and organs/offal (such as liver, heart, blood), as well as milk, yoghurt, cheese and eggs are good sources of *protein*.

The flesh and organs of animals, birds and fish, and foods prepared with blood, are the best sources of *iron* and *zinc*. This is because iron and zinc in these foods are very well absorbed. The redder the flesh and organs when raw, the more iron they contain (see Box 1, p19).

Iron, vitamin A and *folate* are stored in liver, so even small servings of liver provide large amounts of these nutrients. Egg yolk has a store of nutrients and is another rich source of *vitamin A*. The *iron* content of egg yolk is high, but it is not well absorbed. Milk fat (cream) contains *vitamin A* so foods made from *whole* milk contain vitamin A.

Foods made from milk and any food containing bones that are eaten (e.g. small fish, canned fish, or pounded dried fish) are good sources of *calcium*.

Questions

Look at the foods listed below and circle the ones that are available in your area. If there are others, add their names.

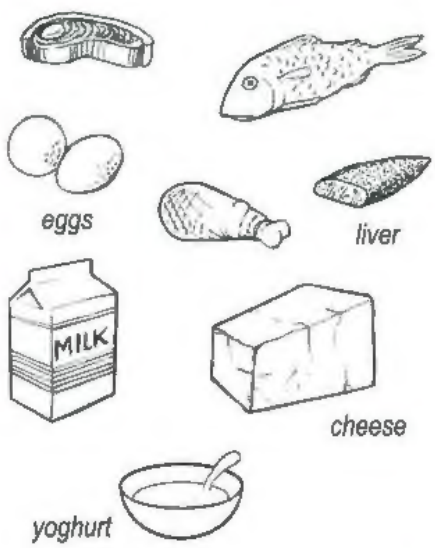
Animals, birds, fish	Foods from milk	Eggs
beef	fresh whole milk	hen's eggs
lamb/mutton/goat	fresh skimmed milk	
pork	dried whole milk	
liver/kidney/other offal	dried skimmed milk	
rabbit	evaporated whole milk	
wild animals, insects	condensed whole milk	
chicken	cheese	
duck/other birds	yoghurt	
fresh fish	curds	
dried fish eaten whole		
canned fish eaten whole		
shell fish/other fish		

TIP

Cooking some pulses takes a long time. To save fuel, soak pulses then boil them really well for at least 20 minutes to destroy anti-nutrients. Then put the pot in a big box filled with insulating materials (e.g. dry grass or soft cushions filled with straw or polystyrene granules). Leave the pot in the box for about 3 hours to finish cooking. Leaving overnight is even better. Note: do not use the box for keeping food warm. Any uneaten food must be boiled again before eating.

TIP

Learn about the resources families have. If your advice is unrealistic, people will not follow it. For example, mothers cannot sieve cooked pulses if they have no sieve.



Look at the ones you have circled.

1. *Which dark-green leaves and orange-coloured vegetables and fruits grow in your area?*

   .....

   .....

   .....

(Note: oranges, despite their colour, are not a rich source of vitamin A)

2. *Are any considered unsuitable for young children?* ❒ *YES* ❒ *NO*
   If so, why?

   .....

   .....

3. *Can families suggest ways to make these foods more suitable for children?*

   .....

   .....

4. *For the foods you have circled, write the months of the year when they are available*

   .....

   .....

5. *Are there any months when none of these foods is available?* ❒ *YES* ❒ *NO*
   If so, which months are these?

   .....

   .....

6. *And can you help families overcome this lack?*
   For example:
   - *ask an agricultural officer which dark-green leafy plants or orange-coloured vegetables and fruits grow best in different seasons*
   - *suggest families fence a small area close to the house and plant fast-growing vegetables*
   - *use waste water for watering.*

Box 1. Sources of iron and iron absorption

The amount of iron that a child absorbs from food depends on:

- the amount of iron in the food
- the type of iron (iron from meat and fish is better absorbed than iron from plants, milk and eggs)
- the types of other foods present in the same meal (some *promote* iron absorption and others *interfere*)
- whether the child is anaemic (more iron is absorbed if anaemic).

Examples of foods high in iron

High iron, good absorption	**High iron, poor absorption**
Liver of all kinds	Egg yolk
Other organs/offal, especially red organs and blood	Pulses
Flesh of animals, especially red meats	Dark-green leaves
Flesh of birds, especially dark meat	
Foods fortified with iron (such as fortified infant cereals)	

The amount of iron absorbed from eggs, milk and plant foods (e.g. cereals, pulses, other seeds, vegetables and fruits) is:

- **increased by eating at the same meal:**
  - foods rich in vitamin C
  - flesh and organs/offal of animals, birds
  - fish and other seafood
- **decreased by drinking:**
  - teas and coffee.

Eating foods rich in vitamin C at the same meal is the best way to *improve* the absorption of iron from eggs, milk and plant foods. Foods rich in vitamin C include guava, mango, orange and other citrus fruits, paw-paw and pineapple (see Annex 1).

Eating fermented cereals increases iron absorption.

Adding a variety of vegetables to the child's diet greatly contributes to meeting micronutrient needs.

For instance, a small amount of vegetables given as complementary food is enough to cover the child's vitamin A needs for one day.

age group	*carrots*		*sweet potato*		*dark green vegetables*
6 - 12 months	1 1/2 Tbs	or	1 Tbs	or	1/3 cup
1 - 2 years	1 1/2 Tbs		1 Tbs		1/3 cup
2 - 6 years	2 1/2 Tbs		1 Tbs		1/3 cup